76. (Amended) A method of controlling a system including:

a compressor bank including at least one compressor;

a plurality of cryogenic refrigerators supplied with refrigerant from the compressor bank, the method comprising:

identifying the refrigeration requirements of each of the refrigerators, and

from a controller, allocating a supply of refrigerant to the refrigerators according to the identified requirements, the allocating further comprising computing a helium allocation as a portion of a determined helium supply.

Amendments to the claims are indicated in the attached "Marked Up Version of Amendments" (page i-ii).

REMARKS

The Examiner has rejected Claims 1, 56 and 76 based on Eacobacci '109. Eacobacci, however, is inapplicable to the invention as defined by the present claims because Eacobacci monitors temperature in relation to a setpoint, while the present claims are directed to an allocation of refrigerant.

Eacobacci controls each refrigerator by monitoring the temperature. Each refrigerator so controlled is controlled based on the temperature in relation to a setpoint. No comparison, or computation, appears to be performed based on the operation of a particular refrigerator with respect to the other refrigerators. A particular refrigerator's temperature appears to be the sole input to the setpoint comparison, as described at col. 7, lines 13-61. Accordingly, the Eacobacci system may determine that each refrigerator is in need of helium, and therefore allow each refrigerator to attempt to draw a quantity of helium which, in aggregate for all refrigerators so controlled, exceeds the total helium available. Similarly, the Eacobacci system may determine that each refrigerator is satisfied with respect to the temperature setpoint, and permit helium to be unutilized.

In the system defined by the present claims, a total available quantity of helium refrigerant is computed to be apportioned to all refrigerators. A portion of this total available quantity of helium is then computed as a helium allocation for each refrigerator, as described in the specification at page 12, lines 17-21, page 13, line 20 - page 14, line 12 and page 18, lines 7-26. This portion, or helium allocation, is computed in relation to the needs of other refrigerators, and is adjusted up or down depending on the portion allocated to the other refrigerators such that the total available quantity is allocated among the refrigerators based on the needs of all refrigerators. Nowhere in Eacobacci is shown or disclosed a helium allocation computed as a portion of the determined available quantity of refrigerant. Accordingly, claim 1 has been herein amended to recite that the refrigerant allocation is computed as a portion of the determined available quantity, and also initially distributing the refrigerant to the refrigerators based on the determined allocation. Further, claims 56 and 76 have been similarly amended, with respect to computing a portion of the available quantity, to further clarify and distinguish the present claims.

The Examiner has further rejected claim 20 under 35 U.S.C. § 103(a) based on Eacobacci '109 in view of Derosier '248. The Examiner suggests that Derosier incrementally increases control parameters. Derosier, however, discloses incrementally opening an expansion valve (col. 10, line 42 - col. 11, line 7). The present application, on the contrary, increases the computed available quantity of refrigerant, as described at page 17, line 14 - page 18, line 6. Therefore, one skilled in the art would not look to Derosier '248 to modify Eacobacci because Derosier is directed to control of an expansion valve, not to a computed quantity. Further, as the invention as defined by the present claims is not directed to expansion valves, even if one were to combine Eacobacci '109 with Derosier '248, the invention as defined by the present claims would still not be realized. Accordingly, it is submitted that Derosier does not teach or suggest the invention claimed in claim 20 for the same reasons cited above with respect to claim 1.

The Examiner has further rejected claim 19 under 35 U.S.C. § 103(a) based on Eacobacci '109 in view of Morishita '948. The Examiner suggests that Morishita '948 discloses a hierachy state, however, a "hierarchy" is not recited in the specification or claims. It appears

from the Examiner's underlines that the Examiner is referring to the communications network 28 connecting the cryopumps. To the extent that this network could be considered a hierarchy, it refers to the physical interconnections between the cryopumps. The hierarchy recited in claim 19 refers to an order of importance of the cryopumps, as described in the specification at page 22, line 23 - page 24, line 18. Accordingly, claim 19 has been herein amended to recite that the hierarchy is indicative of an order of importance of the refrigerators, to further clarify and distinguish the invention as defined by the present claims.

As to the remaining claims 2-18, 21-28, 51, 57-64, 77 and 78 all depend, either directly or indirectly from claims 1, 56 and 76, it is submitted that these claims are also in condition for allowance.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned at (978) 341-0036.

Respectfully submitted,

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.

By_____

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Dated: 7/30/02

MARKED UP VERSION OF AMENDMENTS

Claim Amendments Under 37 C.F.R. § 1.121(c)(1)(ii)

1. (Amended) A method for controlling distribution of refrigerant among a plurality of refrigerators comprising:

determining an available quantity of the refrigerant;

determining a demand of the refrigerant by each of the plurality of refrigerators;

aggregating the demand from the refrigerators;

determining, for each of the refrigerators, an allocation of the refrigerant based on the availability of the refrigerant, the aggregated demand and the individual needs of the refrigerators, the allocation computed as a portion of the determined available quantity;

distributing the refrigerant to the refrigerators based on the determined allocation; and

redistributing [the allocation of] the refrigerant over time by redetermining the allocation of the refrigerant.

19. (Amended) The method of claim 15 wherein a distribution per hierarchy state is indicative of selectively diverting the refrigerant away from refrigerators according to a predetermined order based on the importance of each of the refrigerators.

56. (Amended) A method of delivering helium to a plurality of cryogenic refrigerators connected to a common refrigerant source comprising:

sensing at least one operating parameter indicative of the operating status of each cryogenic refrigerator;

computing, at a controller, from the at least one parameter and a helium supply, an allocation signal indicative of an allocation of refrigerant computed as a portion of a determined helium supply, the allocation signal computed in response to a computed helium consumption; and

controlling a drive motor connected to each of the cryogenic refrigerators to regulate the helium consumed by the cryogenic refrigerator according to the allocation signal.

76. (Amended) A method of controlling a system including:

a compressor bank including at least one compressor;

a plurality of cryogenic refrigerators supplied with refrigerant from the compressor bank, the method comprising:

identifying the refrigeration requirements of each of the refrigerators, and

from a controller, allocating a supply of refrigerant to the refrigerators according to the identified requirements, the allocating further comprising computing a helium allocation as a portion of a determined helium supply.